

# PATENT ABSTRACTS OF JAPAN

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(71)Applicant : UNION KUCHO KOGYO KK

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(72)Inventor : FURUTA SADAJI

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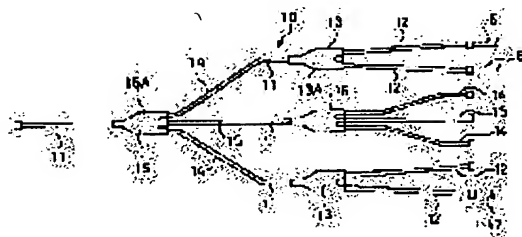
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## (54) BRANCH JOINT FOR REFRIGERANT PIPE

(57)Abstract:

**PROBLEM TO BE SOLVED:** To easily connect a large number of branch pipes to each other, and also equalize a flow rate to be separated in a branch joint for a refrigerant pipe.

**SOLUTION:** A branch joint for a refrigerant pipe is composed of a combination of bifurcated branch pipes 13 whose branch pipes 12 and 12 are branched off in the isometric two directions to a main pipe 11 and trifurcated branch pipes 16 branched off so that a crossed axes angle of the mutual tube axes of outside branch pipes 14 and 14 becomes an acute angle in the three directions to the main pipe 11 and the tube axis of an intermediate single branch pipe 15 becomes an almost bisector of the crossed axes angle, and the parallel number of the branch pipes 12 to 15 is increased by connecting the main pipe 11 to the tail ends of the respective branch pipes 12, 14 and 15, and a refrigerant carrying pipe 6 to an indoor machine can be connected to the tail ends of the increased branch pipes 12 to 15 so as to be freely mountable/demountable.



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CLAIMS

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[Claim(s)]

[Claim 1] a main pipe -- receiving -- a flow direction -- the branch branch pipe which branched a branch pipe in the two same directions, and a main pipe -- receiving -- a flow direction -- the branch joint for refrigerant pipes characterized by coming to be enabled connection of refrigerant conveyance tubing to an interior unit at the end of the branch pipe to which consist of combination with the gin branch pipe which branched the same three way, the number of juxtaposition of a branch pipe is increased by connecting said main pipe to the end of each of said branch pipe, and it made increase free [ attachment and detachment ].

[Claim 2] The branch joint for refrigerant pipes characterized by covering the whole with a heat insulator except for the slot section of a root main pipe's opening edge, and the last end of a branch pipe in the branch joint for refrigerant pipes of claim 1.

[Claim 3] The branch joint for refrigerant pipes with which connection with each branch pipe and a main pipe is made to connection by the socket and the slot, the connection immersion depth of the slot to a socket is made into 1.5 or more times of a tube outer diameter in the branch joint for refrigerant pipes of claim 1 or claim 2, and the extension taper angle of said method of the socket back is characterized by 5-30 degrees of things which it comes to make the interior angle of the corner of the opening edge external surface of said slot into the include angle below a right angle further.

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DETAILED DESCRIPTION

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[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the branch joint for refrigerant pipes.

[0002]

[Description of the Prior Art] It is performed that air conditioners, such as a building, usually make distribution connection of many interior units of a base with a refrigerant pipe at one set of an exterior unit.

[0003] As the Rhine branch joint 4 of a branch is arranged in the location corresponding to the exterior unit 3 of the refrigerant main pipe 2 who came out of the exterior unit 1 as shown in drawing 9 and it is indicated in drawing 10 as the method distributed to each interior unit 3 as a method of this distribution connection Branch pipe 5A of the number beforehand corresponding to an exterior unit 3--3 to the refrigerant main pipe 2 who came out of the exterior unit 1 -- The header branch joint 5 which branched 5A in the shape of [ of a comb ] a gear tooth is arranged, and there is a method distributed to each interior unit 3 from here.

[0004] But the connection type shown in drawing 9 and drawing 10 is what was simplified for explanation, and in practice, these are put together suitably and it is made into complicated piping structure.

[0005]

[Problem(s) to be Solved by the Invention] By the way, although the joint 4 of Rhine branching shown in drawing 9 among the above-mentioned branch joints had little resistance of flow since the direction of splitting turned into a direction along the flow direction of a refrigerant, and it had the advantage which can do equal splitting, the construction between which cut a refrigerant main pipe for every location of an interior unit, and the branch pipe is made to be placed was needed, and there was a problem which the various evils accompanying this produce.

[0006] That is, in the interior of a refrigerant pipe, two sorts, a gaseous phase and the liquid phase, are intermingled, and, moreover, flowing fluid serves as high pressure in many cases. For this reason, it is necessary to make the connection part of a branch pipe into advanced watertight construction, and it becomes indispensable soldering [ of a connection ] in connection by the socket slot.

[0007] And since this soldering part became a repeat activity for every branch pipe corresponding to an interior unit, when there were N interior units 3 which there is a problem to which an activity becomes complicated, for example, are shown in drawing 9 , the number and its soldering part of a branch pipe 4 had the problem it becomes as complicated as the large-sized building where it becomes N-1 place, and N becomes a large number working.

[0008] Moreover, since it was prepared in narrow space, such as the underpart of the roof, when soldering construction became very difficult, since piping used the high temperature flame for soldering, the risk of a fire also had a certain problem. Moreover, since the immersion depth to the socket of a slot was one half extent of a tube diameter at most conventionally in connection by the socket slot, there was a problem from which a soldering activity [ in a narrow location which temporary support becomes unstable and was mentioned above ] becomes still more difficult only by inserting a slot in a socket in the case of huge tubing.

[0009] Moreover, in the case of the refrigerant pipe, it was covered with the heat insulator for dew condensation prevention, but the covering activity also had the problem which became complicated and also often produced the dew condensation accident by poor covering. Although there were few problems like the above-mentioned Rhine branch joint at the point of workability since it collected in the piece place in the case of the header branch joint 5 shown in drawing 10  $R > 0$  and the pipe-connection activity was completed, since flowing fluid was shunted in the direction of a right angle in the main pipe, the flow rate to a branching branch pipe was not stabilized, but there was a problem from which equal splitting becomes difficult.

[0010] This invention can be performed as the flow rate which is made for the purpose of solving the above-mentioned trouble, and can connect many branch pipes easily, and is shunted is also equal, and it is made for the purpose of offering the branch joint for refrigerant pipes which took

in the advantage of both the above-mentioned Rhine branching and header branching.

[0011]

[Means for Solving the Problem] The branch branch pipe with which the branch joint for refrigerant pipes of claim 1 branched the branch pipe in the two directions of flow direction identitas to the main pipe, It consists of combination with the gin branch pipe which branched the three way of flow direction identitas to the main pipe. It is characterized by coming to enable connection of refrigerant conveyance tubing to an interior unit at the end of the branch pipe to which the number of juxtaposition of a branch pipe is increased, and it was made to increase free [ attachment and detachment ] by connecting said main pipe to the end of each of said branch pipe.

[0012] That is, since it uses for a flow direction combining \*\*\*\*\* which has the branch pipe which branches in the same direction, or a gin branch pipe to a main pipe when branching the main pipe of one in a required number, splitting with it can be performed. [ there is little resistance in the case of splitting, and equal ]

[0013] Moreover, since the branch joint for refrigerant pipes can be beforehand manufactured on a works production target, a soldering activity can also be ensured and leakage accident does not happen, either. The branch joint for refrigerant pipes of claim 2 is characterized by covering the whole with a heat insulator except for the slot section of a root main pipe's opening edge, and the last end of a branch pipe in the branch joint for refrigerant pipes of claim 1.

[0014] Since the whole branch joint for refrigerant pipes which branches a required number is beforehand covered with the heat insulator, while the heat insulator covering activity by site operation is omissible, since a works production target can be made to cover a heat insulator like the branch joint body for refrigerant pipes, its adiabatic efficiency is also good.

[0015] The branch joint for refrigerant pipes of claim 3 is set to the branch joint for refrigerant pipes of claim 1 or claim 2. Connection with each branch pipe and a main pipe is made to connection by the socket and the slot, and the connection immersion depth of the slot to a socket It considers as 1.5 or more times from a tube outer diameter, and the extension taper angle of said method of the socket back is characterized by 5-30 degrees of things which it comes to make the interior angle of the corner of the opening edge external surface of said slot into the include angle below a right angle further.

[0016] Temporary support can be carried out only by inserting, since the connection immersion depth of the slot to a socket is made deep, and a soldering connection activity [ in a site ] also becomes easy. It is because a slot is shaky here and the temporary support at the time of soldering is needed for it, when a slot is inserted in a socket when it is shallower than 1.5 times to make the connection immersion depth of the slot to a socket into 1.5 or more times from a tube outer diameter here. In addition, although especially the upper limit of the immersion depth is not limited, since the effective length of tubing will become short if it is made not much deep, it stops in the suitable depth.

[0017] Moreover, the extension taper angle of said method of the socket back is made into 5-30 degrees for making the corner of the opening edge external surface of a slot eat into a socket back end, and stabilizing temporary support. It is because it will eat away if said taper angle is made larger than 30 degrees, and the force may become less enough, a slot may fall out with a self-weight in the case of perpendicularly near piping and temporary support is needed.

[0018] Moreover, if smaller than 5 degrees, it may become difficult for a slot to eat into a socket back end and to remove from the condition of temporary support. Therefore, it becomes the desirable range to make the extension taper angle of the method of the socket back into 5-30 degrees conjointly with using the interior angle of the corner of slot opening edge external surface as an acute angle 90 degrees or less.

[0019]

[Embodiment of the Invention] Next, the gestalt of 1 implementation of this invention is explained. The top view of the branch joint for refrigerant pipes which drawing 1 requires for this invention, and drawing 2 are the explanation top views of the joint which constitutes the body of the branch joint for refrigerant pipes shown in drawing 1 .

[0020] The branch joint 10 for refrigerant pipes concerning invention of claim 1 The branch

branch pipe 13 which branched branch pipes 12 and 12 in the two directions of flow direction identitas to the main pipe 11 as shown in drawing 2 . It consists of combination with the gin branch pipe 16 with the branch pipes 14, 14, and 15 which branch to the three way of flow direction identitas to a main pipe 11. Connection of the refrigerant conveyance tubing 6 to an interior unit 3 is enabled free [ attachment and detachment ] at the end of the branch pipes 12-15 to which the number of juxtaposition of branch pipes 12-15 is increased by connecting said main pipe 11 to the end of each branch pipes 12, 14, and 15 as shown in drawing 1 , and it was made to increase.

[0021] In addition, in the above, the branch pipes 12 and 12 of the branch branch pipe 13 have branched in the direction of the symmetry on both sides of the main pipe 11. moreover, as for the gin branch pipe 16, the outside branch pipes 14 and 14 branch in the direction of the symmetry on both sides of a main pipe 11 -- having -- inside -- the tube axis of one branch pipe 15 -- said branch pipes 14 and 14 -- he is trying to come on a center line mostly

[0022] In addition, in the above, it is supposed that connection with the branched branch pipes 12, 14, and 15 is possible for each main pipe 11, and, as for the end of these branch pipes 12-15, it is desirable to cut to an even length so that it may stand in a line in the direction of a right angle in a straight line mostly to a tube axis like illustration.

[0023] Moreover, that in which the tees 13A and 16A of the branch branch pipe 13 and the gin branch pipe 16 are the taper-like short pipes whose diameter have a path equal to a main pipe 11, and was expanded in the shape of a taper from there as the example of the branch branch pipe 13 shows, they have arranged the branch pipe 12 to drawing 3 at the diameter expansion side edge section, collapsed it with a press, and were formed is used.

[0024] In addition, drawing 3 is what showed an example of the structure of a branch pipe, may weld separate tubing directly and may form it, respectively. Anyway, the branch branch pipe 13 and the gin branch pipe 16 are produced by the works production target, soldering of leakage control is given and each connection is formed.

[0025] Moreover, a degree can be made into the degree of a large number, such as 27 branching, from four branching with the combination of the branch branch pipe 13 and the gin branch pipe 16, as shown in drawing 4 . And fitting of the attachment and detachment of the plug 17 for sealing is made free to the end of the branch pipes 12-15 to which it was made to increase, and only the required branch pipes 12-15 are alternatively made usable.

[0026] Drawing 5 is the top view showing the gestalt of operation of the branch joint for refrigerant pipes of claim 2. In drawing 5 , except for the slot sections 12B-15B of the opening edge of the root main pipe 11 of the branch joint 10 for refrigerant pipes and the last end of branch pipes 12-15 which were shown in drawing 1 , the branch joint 10 for refrigerant pipes covers the whole with a heat insulator 18, and is constituted.

[0027] It is produced by the works production target like the branch joint for refrigerant pipes which also showed this heat insulator 18 to drawing 1 . Drawing 6 is the important section sectional view showing the gestalt of operation of the branch joint for refrigerant pipes of claim 3.

[0028] In drawing 6 , the connection type of the main pipe 11 of the branch joint 10 for refrigerant pipes who showed the branch joint for refrigerant pipes to drawing 1 or drawing 5 , and each branch pipes 12-15 is made into a socket slot method, and connection immersion-depth s of slot 12B to socket 11A is made into 1.5 or more times from the tube outer diameter d.

[0029] Moreover, let further 5-30 degrees of interior angles alpha of corner 12C of the opening edge external surface of said slot 12B be an include angle below a right angle for the extension taper angle theta of the method of the socket 11A back. Using the connection immersion depth of the slot to a socket as 1.5 or more times from a tube outer diameter in the above for ensuring temporary support when inserting slot 12B in socket 11A, when fewer than this, it is because slot 12B may be shaky within socket 11A and may cause difficulty to a soldering activity [ in a site ] etc. only by inserting.

[0030] Moreover, if the connection immersion depth of a slot is made larger than a tube outer diameter, in respect of temporary support, it is good, but if it is made not much deep, the

effective length of tubing will become short and effectiveness will worsen. When these were taken into consideration and a suitable tube diameter and the suitable immersion depth were actually examined, a result of Table 1 was brought. The dimension relation, then required sufficient temporary support of this table 1 can be performed. The spigot depth of this invention is made into 2.4 to 3.75 times of a JIS standard size so that more clearly than the ratio for JIS of Table 1.

[Table 1]

管径呼び径	従来 J I S 差込サイズ	本発明差込サイズ	対 J I S 比
9.5 $\phi$	7 mm	18 mm	2.57
12.7	8	30	3.75
15.88	10	30	3.0
19.05	10	30	3.0
22.2	10	30	3.0
25.4	12	36	3.0
28.58	12	36	3.0
31.75	12	36	3.0
34.93	14	45	3.21
38.1	14	45	3.21
41.3	14	45	3.21
44.45	14	50	3.57
50.8	20	60	3.0
53.98	20	60	3.0
63.5	25	60	2.4

[0031] Moreover, as for the bore of this socket, and the outer diameter of a slot, considering as the smallest possible crossover is desirable. Furthermore, the taper angle theta of diameter expansion section 11B of the above-mentioned method of the socket 11A back is made into 5-30 degrees, and as the interior angle alpha of the corner of opening edge 12C of slot 12B expands and shows in a part Fig., it considers as an acute angle smaller than a right angle.

[0032] The above-mentioned taper angle theta and the interior angle alpha are for making opening edge 12C of slot 12B eat away, and demonstrating a certain amount of ejection prevention force, when slot 12B is inserted. When turning slot 12B upwards although slot 12B is not shaky within socket 11A if larger than 30 degrees, and inserting and attaching in socket 11A, it is because a slot may fall out by self-weight and temporary support is needed.

[0033] Moreover, the interior angle alpha of the corner of opening edge 12C of slot 12B is made smaller than a right angle for demonstrating the above-mentioned interlocking certainly, and if the interior angle alpha is made larger than a right angle, it will eat away, and the force is insufficient for it.

[0034] Furthermore, the slot 19 wide opened by the diameter expansion section 11B inside of the method of the socket back by this interior angle alpha to the inner direction is formed, and since the molten metal 20 of soldering collects and this slot 19 serves as the section, the dependability of the soldering section increases.

[0035] Drawing 7 shows the side elevation of the mold 21 for fabricating the above-mentioned socket 12B, and this mold 21 is inserted in the opening edge of tubing 10A, such as a copper tube used as the molding material of the branch joint 10 for refrigerant pipes, and consists of rodding 21A which expands the diameter of tubing opening, and base 21B which supports this rodding.

[0036] The point of rodding 21A is set to taper side 21B which forms the taper angle theta of the diameter expansion section of the method of the socket 12B back, the diameter of base 21B side edge 21C of rodding 21A is further expanded in the shape of a taper, and he is trying to

expand the diameter in the shape of a taper in the opening edge of socket 12B.

[0037] Soldering material can make it easy to flow in between a socket 12B inside and slot 11A external surface by diameter expansion of the shape of this taper, and the dependability of soldering increases further. Next, the busy condition of the gestalt of the above-mentioned implementation is explained.

[0038] As shown in drawing 8, the main pipe 11 of the branch joint 10 for refrigerant pipes is connected to refrigerant outlet 1A of an exterior unit 1, a required number of branching is carried out and the interior unit 3--3 required for this is connected. In this case, the branch joint 10 for refrigerant pipes of this invention can be further connected to the point of the branch pipes 12-15 of the branch joint 10 for refrigerant pipes, and branching can also be increased.

[0039] Therefore, when the arrangement part piece place of this branch joint for refrigerant pipes is available for two or more branching to each interior unit from a main pipe and construction becomes possible collectively, since welding of soldering etc. is carried out at the time of works production, airtightness is very high [ the tee of the branch joint for refrigerant pipes ], and the leakage accident which originates in poor welding by site operation at the time of manufacture since a compressive test and splitting inspection are possible is prevented certainly.

[0040] Furthermore, it can distribute a refrigerant equally until there is little resistance of flow, it does not have channeling of each branch pipe for this reason and results in an end, since the tee of each branch pipe has branched in the direction along a flow direction.

[0041]

[Effect of the Invention] As explained above, the branch joint for refrigerant pipes of this invention Since many branch pipes are beforehand combined in one, much duct branching activities are completed to coincidence by arrangement of a piece place, and construction is simplified very much. For this reason, the complicatedness of a soldering activity [ at the height of an a large number part ] and the fire use in that case become unnecessary like the conventional Rhine branching. Furthermore, since [ to require ] the tee was beforehand welded at the time of works production, the airtightness of a tee is very high, and since implementation of inspection, such as a compressive test and splitting inspection, can be performed, the leakage accident by the site operation often produced until now can be prevented certainly.

[0042] Moreover, it has the effectiveness which can distribute a refrigerant equally efficiently until it results in a duct end, even if there is little resistance at the time of splitting since the tee is made into the gestalt which branches in the shape of an acute angle, and it branches a large number considerably, since it is hard to produce channeling.

[0043] And since the site operation of heat insulator covering can also be omitted in addition to the above-mentioned effectiveness, and this heat insulator is moreover covered by the works production target and implementation of heat insulation inspection can also be performed when it equips with a heat insulator beforehand, it has effectiveness, like adiathermic [ , such as dew condensation prevention, ] becomes trustworthy [ the installation condition of a heat insulator ] well.

[0044] The connection immersion depth of the slot to a socket is enlarged with 1.5 or more times from a tube outer diameter, and it specifically considers as 2.4 or more times to the conventional specification. Further furthermore, with the combination of the taper angle of the diameter expansion section of the method of the socket back, and the interior angle of a slot end face Temporary support in the case of connecting refrigerant conveyance tubing to a branch pipe can be ensured, and connection of the distribution tube to the branch joint for refrigerant pipes of this invention becomes easy, and it has effectiveness, like the dependability of soldering also increases.

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## DESCRIPTION OF DRAWINGS

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[Brief Description of the Drawings]

[Drawing 1] It is the top view of the branch joint for refrigerant pipes concerning invention of claim 1.

[Drawing 2] It is the explanation top view of the joint which constitutes the body of the branch joint for refrigerant pipes shown in drawing 1.

[Drawing 3] It is the explanation perspective view showing an example of the branch joint for refrigerant pipes shown in drawing 1.

[Drawing 4] It is the top view showing the gestalt of other operations of the branch joint for refrigerant pipes concerning invention of claim 1.

[Drawing 5] It is the top view of the branch joint for refrigerant pipes concerning invention of claim 2.

[Drawing 6] It is the important section top view of the branch joint for refrigerant pipes concerning invention of claim 3.

[Drawing 7] It is the side elevation of the mold for socket shaping of the branch joint for refrigerant pipes.

[Drawing 8] It is the busy condition explanatory view of the branch joint for refrigerant pipes.

[Drawing 9] It is the top view of the conventional branch joint for refrigerant pipes.

[Drawing 10] It is the top view of other conventional branch joints for refrigerant pipes.

[Description of Notations]

6 Refrigerant Conveyance Tubing

10 Branch Joint for Refrigerant Pipes

11 Main Pipe

11A Socket

11B Diameter expansion section

12 Branch Pipe

12B Slot section

12C Slot end face

13 Branch Branch Pipe

13A Tee

14 Outside Branch Pipe

15 It is One Branch Pipe Inside.

16 Gin Branch Pipe

16A Tee

17 Plug for Sealing

18 Heat Insulator

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(71)出願人 593083505

ユニオン空調工業株式会社

大阪府守口市寺方本通2丁目7番7号

(72)発明者 古田 定治

大阪府守口市寺方本通2丁目7番7号 ユ

ニオン空調工業株式会社内

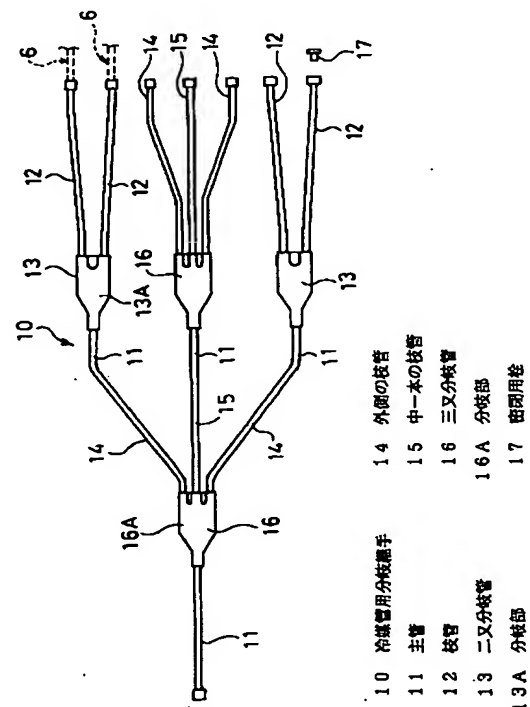
(74)代理人 弁理士 森本 義弘

(54)【発明の名称】 冷媒管用分岐継手

(57)【要約】

【課題】 冷媒管用分岐継手において、多数の分岐管の接続を容易に可能とし、かつ分流される流量も均等とすることを課題とする。

【解決手段】 主管11に対し等角の二方向に枝管12、12を分岐させた二又分岐管13と、主管11に対し三方向にかつ外側の枝管14、14の管軸同士の交叉角が鋭角とされ、中一本の枝管15の管軸が前記交叉角のほぼ二等分線になるよう分岐させた三又分岐管16との組合せて構成され、各枝管12、14、15の末端に前記主管11を接続することにより分岐管12～15の並列数が増加され、増加させた枝管12～15の末端に室内機3への冷媒搬送管6が着脱自在に接続可能とされている。



**【特許請求の範囲】**

【請求項1】主管に対し流れ方向同一の二方向に枝管を分岐させた二又分岐管と、主管に対し流れ方向同一の三方向に分岐させた三又分岐管との組合せで構成され、前記各枝管の末端に前記主管を接続することにより分岐管の並列数が増加され、増加させた枝管の末端に室内機への冷媒搬送管が着脱自在に接続可能とされてなることを特徴とする冷媒管用分岐継手。

【請求項2】請求項1の冷媒管用分岐継手において、根元主管の開口端と枝管の最終末端との挿口部を除き全体を断熱材で被覆したことを特徴とする冷媒管用分岐継手。

【請求項3】請求項1又は請求項2の冷媒管用分岐継手において、各分岐管と主管との接続が受口と挿口とによる接続とされ、受口に対する挿口の接続挿入深さが、管外径の1.5倍以上とされ、前記受口奥方の拡開テーパ角が $5\sim 30^\circ$ 、さらに前記挿口の開口端外面の角部の内角が直角以下の角度とされてなることを特徴とする冷媒管用分岐継手。

**【発明の詳細な説明】****【0001】**

【発明の属する技術分野】この発明は、冷媒管用分岐継手に関する。

**【0002】**

【従来の技術】ビル等の空調設備は、通常、一台の室外機に多数台の室内機を冷媒管で分配接続することが行われる。

【0003】この分配接続の方式としては、図9に示すように、室外機1から出た冷媒主管2の室外機3に対応する位置に二又のライン分岐継手4を配設し、各室内機3に分配していく方式と、図10に示すように、室外機1から出た冷媒主管2に、予め室外機3…3に対応する数の枝管5A…5Aを櫛の歯状に分岐させたヘッダ分岐継手5を配設し、ここから各室内機3に分配していく方式とがある。

【0004】もっとも、図9、図10に示した接続方式は説明のため単純化したもので、実際上はこれらが適宜組み合わせられ、複雑な配管構造とされる。

**【0005】**

【発明が解決しようとする課題】ところで、上記分岐継手のうち、図9に示したライン分岐の継手4は分流方向が冷媒の流れ方向に沿った方向となるので流れの抵抗が少なく、均等分流ができる利点を有するが、室内機的位置ごとに冷媒主管を切断し分岐管を介在させていく工事が必要となり、これに伴う種々の弊害が生じる問題があった。

【0006】即ち、冷媒管の内部を流れる流体は気相、液相の二種が混在し、しかも高圧となる場合も多い。このため、分岐管の接続部分は高度な水密構造とする必要があり、受口挿口による接続の場合は、接続部の蟻付け

が不可欠となる。

【0007】しかもこの蟻付け箇所は室内機に対応する分岐管ごとの繰返し作業となるので作業が煩雑になる問題があり、例えば図9に示す室内機3がN個あれば分岐管4の数およびその蟻付け箇所はN-1箇所となり、Nが多数になる大型ビルほど作業が煩雑となる問題があった。

【0008】また、配管は天井裏など狭い空間に設けられるので、蟻付け施工が非常に困難となる上、蟻付けには高熱火炎を使用するので火災の危険もある問題があった。また、受口挿口による接続の場合、挿口の受口に対する挿入深さが従来はせいぜい管径の半分程度であったため、長大管の場合受口に挿口を差し込んだだけでは仮支持が不安定となり上述したような狭い場所での蟻付け作業がさらに困難となる問題があった。

【0009】また、冷媒管の場合結露防止のため断熱材で被覆されるが、その被覆作業も煩雑となり被覆不良による結露事故もしばしば生じていた問題があった。図10に示したヘッダ分岐継手5の場合は、一個所でまとめて管接続作業ができるので作業性の点では上記のライン分岐継手のような問題は少ないが、主管を流れる流体が直角方向に分流されるので分岐枝管への流量が安定せず、均等な分流が困難となる問題があった。

【0010】この発明は、上記問題点を解決することを目的としてなされたものであり、多数の分岐管の接続が容易に行え、かつ分流される流量も均等とでき、上記のライン分岐とヘッダ分岐の両方の長所を取り入れた冷媒管用分岐継手を提供することを目的としてなされたものである。

**【0011】**

【課題を解決するための手段】請求項1の冷媒管用分岐継手は、主管に対し流れ方向同一の二方向に枝管を分岐させた二又分岐管と、主管に対し流れ方向同一の三方向に分岐させた三又分岐管との組合せで構成され、前記各枝管の末端に前記主管を接続することにより分岐管の並列数が増加され、増加させた枝管の末端に室内機への冷媒搬送管が着脱自在に接続可能とされてなることを特徴とするものである。

【0012】即ち、一本の主管を必要な数に分岐させる場合、主管に対し流れ方向に同一の方向に分岐する枝管を有する二又利または三又分岐管を組み合わせて用いるので、分流の際の抵抗が少なく均等な分流が行える。

【0013】また、冷媒管用分岐継手は予め工場生産的に製造できるので、蟻付け作業も確実に行え漏洩事故も起こらない。請求項2の冷媒管用分岐継手は、請求項1の冷媒管用分岐継手において根元主管の開口端と枝管の最終末端との挿口部を除き全体を断熱材で被覆したことを特徴とするものである。

【0014】必要な数に分岐させる冷媒管用分岐継手全体を断熱材で予め被覆しているため現場施工での断熱材

被覆作業が省略できると共に断熱材は冷媒管用分岐継手本体と同様工場生産的に被覆させることができるので断熱効果も良い。

【0015】請求項3の冷媒管用分岐継手は、請求項1又は請求項2の冷媒管用分岐継手において、各分岐管と主管との接続が受口と挿口とによる接続とされ、受口に対する挿口の接続挿入深さが、管外径より1.5倍以上とされ、前記受口奥方の拡開テーパ角が $5\sim 30^\circ$ 、さらに前記挿口の開口端外面の角部の内角が直角以下の角度とされてなることを特徴とするものである。

【0016】受口に対する挿口の接続挿入深さが、深くされているので差し込むだけで仮支持でき、現場での蟻付け接続作業も容易となる。ここに、受口に対する挿口の接続挿入深さを、管外径より1.5倍以上とするのは、1.5倍より浅いと受口に挿口を挿入したとき、挿口がぐらつき、蟻付け時の仮支持が必要となるからである。なお、挿入深さの上限は特に限定しないが、あまり深くすると管の有効長が短くなるので適当な深さに止める。

【0017】また、前記受口奥方の拡開テーパ角を $5\sim 30^\circ$ とするのは、挿口の開口端外面の角部を受口奥端に食い込ませて仮支持を安定させるためである。前記テーパ角を $30^\circ$ より大きくすると食い込み力が充分でなくなり垂直に近い配管の場合、挿口が自重により抜け落ちる場合があり仮支持が必要となるためである。

【0018】また、 $5^\circ$ より小さいと、受口奥端に挿口が食い込んで仮支持の状態から外すのが困難となる場合がある。従って、挿口開口端外面の角部の内角を $90^\circ$ 以下の鋭角とすることと相俟って、受口奥方の拡開テーパ角を $5\sim 30^\circ$ とするのが好ましい範囲となる。

【0019】

【発明の実施の形態】次に、この発明の一実施の形態を説明する。図1は、この発明にかかる冷媒管用分岐継手の平面図、図2は図1に示した冷媒管用分岐継手の本体を構成する継手の説明平面図である。

【0020】請求項1の発明にかかる冷媒管用分岐継手10は、図2に示すように主管11に対し流れ方向同一の二方向に枝管12、12を分岐させた二又分岐管13と、主管11に対し流れ方向同一の三方向に分岐する枝管14、14、15を有した三又分岐管16との組合せで構成され、図1に示すように各枝管12、14、15の末端に前記主管11を接続することにより分岐管12～15の並列数が増加され、増加させた枝管12～15の末端に室内機3への冷媒搬送管6が着脱自在に接続可能とされている。

【0021】なお、上記において二又分岐管13の枝管12、12は主管11を挟んで対称方向に分岐されている。また、三又分岐管16は、外側の枝管14、14が主管11を挟んで対称方向に分岐され、中一本の枝管15の管軸が前記枝管14、14のほぼ中心線上になるよ

うにされている。

【0022】なお、上記において、各主管11は分岐された枝管12、14、15に接続可能とされ、これら枝管12～15の末端は、図示のように管軸に対しほぼ直角方向に一直線に並ぶよう切り揃えておくことが好ましい。

【0023】また、二又分岐管13および三又分岐管16の分岐部13A、16Aは、図3に二又分岐管13の例で示すように主管11に等しい径を有しそこからテーパ状に拡張されたテーパ状短管であって、拡張側端部に枝管12を配置しプレスにより圧壊して形成されたものなどが使用される。

【0024】なお、図3は分岐管の構造の一例を示したもので、別々の管をそれぞれ直接溶接して形成したものであっても良い。いずれにせよ、二又分岐管13および三又分岐管16は工場生産的に生産され各接続部は漏洩防止の蟻付けが施されて形成されている。

【0025】また、分岐数は、図4に示すように二又分岐管13と三又分岐管16の組み合わせによって4分岐から27分岐など多数の分岐数にすることができる。そして、増加させた枝管12～15の末端には密閉用栓17が着脱自在に嵌合され、必要な枝管12～15のみ選択的に使用可能とされている。

【0026】図5は請求項2の冷媒管用分岐継手の実施の形態を示す平面図である。図5において冷媒管用分岐継手10は、図1に示した冷媒管用分岐継手10の根元主管11の開口端と枝管12～15の最終末端との挿口部12B～15Bを除き全体を断熱材18で被覆して構成されている。

【0027】この断熱材18も図1に示した冷媒管用分岐継手と同様工場生産的に生産される。図6は請求項3の冷媒管用分岐継手の実施の形態を示す要部断面図である。

【0028】図6において冷媒管用分岐継手は、図1又は図5に示した冷媒管用分岐継手10の主管11と各枝管12～15の接続方式が受口挿口方式とされ、受口11Aに対する挿口12Bの接続挿入深さsが、管外径dより1.5倍以上とされている。

【0029】また、受口11A奥方の拡開テーパ角 $\theta$ が $5\sim 30^\circ$ 、さらに前記挿口12Bの開口端外面の角部12Cの内角 $\alpha$ が直角以下の角度とされている。上記において受口に対する挿口の接続挿入深さを、管外径より1.5倍以上とするのは、受口11Aに挿口12Bを挿入した時の仮支持を確実にするためであって、これより少ないと、挿入しただけでは挿口12Bが受口11A内でぐらつき、現場での蟻付け作業等に困難をきたすことがあるためである。

【0030】また、挿口の接続挿入深さを、管外径より大きくすれば仮支持の点では良いが、あまり深くすると管の有効長が短くなって効率が悪くなる。これらを勘案

し好適な管径と挿入深さを実際に試験したところ表1の結果となった。この表1の寸法関係とすれば必要十分な仮支持ができる。表1の対JIS比より明らかなよう

に、本発明の差込深さはJIS規格寸法の2.4~3.75倍とされている。

【表1】

管径呼び径	従来JIS差込サイズ	本発明差込サイズ	対JIS比
9.5 $\phi$	7 mm	18 mm	2.57
12.7	8	30	3.75
15.88	10	30	3.0
19.05	10	30	3.0
22.2	10	30	3.0
25.4	12	36	3.0
28.58	12	36	3.0
31.75	12	36	3.0
34.93	14	45	3.21
38.1	14	45	3.21
41.3	14	45	3.21
44.45	14	50	3.57
50.8	20	60	3.0
53.98	20	60	3.0
63.5	25	60	2.4

【0031】また、この受口の内径と挿口の外径はできる限り小さな交差とされることが望ましい。さらに、上記受口11A奥方の拡径部11Bのテーパ角 $\theta$ が5~30°とされ、また挿口12Bの開口端12Cの角部の内角 $\alpha$ が分図に拡大して示すように直角より小さい鋭角とされる。

【0032】上記テーパ角 $\theta$ 、及び内角 $\alpha$ は、挿口12Bを挿入したときに、挿口12Bの開口端12Cを食い込ませて、ある程度の抜け出し防止力を発揮させるため、30°より大きいと、受口11A内で挿口12Bがぐらつくことは無いが、挿口12Bを上方へ向けて受口11Aに挿入して取り付けるような場合、自重で挿口が抜け落ちることがあり仮支持が必要となるからである。

【0033】また、挿口12Bの開口端12Cの角部の内角 $\alpha$ を直角より小さくするのは、上記食い込みを確実に発揮させるためであって、内角 $\alpha$ を直角より大きくすると食い込み力が不足する。

【0034】さらに、この内角 $\alpha$ により受口奥方の拡径部11B内面に内方へ開放された溝19が形成され、この溝19が蟻付けの溶融金属20の溜り部となるので、蟻付け部の信頼性が増す。

【0035】図7は、上記受口12Bを成形するための型21の側面図を示し、該型21は冷媒管用分岐継手10の成形材料となる銅管等の管10Aの開口端に挿入され、管開口を拡径する芯金21Aとこの芯金を支持する基部21Bとからなる。

【0036】芯金21Aの先端部は受口12B奥方の拡径部のテーパ角 $\theta$ を形成するテーパ面21Bとされ、芯

金21Aの基部21B側端21Cがさらにテーパ状に拡径され、受口12Bの開口端がテーパ状に拡径されるようにされている。

【0037】このテーパ状の拡径により受口12B内面と挿口11A外面の間に蟻付け材が流れ込みやすくなり、蟻付けの信頼性がさらに増す。次に、上記実施の形態の使用状態を説明する。

【0038】図8に示すように室外機1の冷媒出口1Aに冷媒管用分岐継手10の主管11を接続し、必要な数の分岐をし、これに必要な室内機3...3を接続していく。この場合、冷媒管用分岐継手10の枝管12~15の先にさらにこの発明の冷媒管用分岐継手10を接続し分岐を増加することもできる。

【0039】従って、主管から各室内機への複数の分岐はこの冷媒管用分岐継手の配設個所一個所でよく、まとめて施工が可能となる上、冷媒管用分岐継手の分岐部は、工場生産時に蟻付け等の溶接がされているので極めて気密性が高く、かつ製造時に耐圧試験、分流検査が可能であるため、現場施工による溶接不良に起因する漏洩事故が確実に防止される。

【0040】さらに、各分岐管の分岐部は流れ方向に沿う方向に分岐されているので流れの抵抗が少なく、このため各枝管の偏流がなく、末端に至るまで均等に冷媒を分配できる。

【0041】

【発明の効果】以上説明したようにこの発明の冷媒管用分岐継手は、あらかじめ多数の枝管を一体的に組み合わせているため、一個所の配設で多数の管路分岐作業が同

時に完了し工事が非常に簡略化され、このため従来のライン分岐のように多数個所の高所での蟻付け作業の煩雑さやその際の火気使用が不要となり、さらに分岐部は予め工場生産時に溶接されているため分岐部の気密性は非常に高く、かつ耐圧試験や分流検査などの検査の実施ができるので、これまでしばしば生じていた現場施工による漏洩事故は確実に防げる。

【0042】また、分岐部は鋭角状に分岐する形態とされているので、分流時の抵抗が少なく、かつ偏流も生じにくいのでかなり多数の分岐を行なっても管路末端に至るまで冷媒を効率良く均等に分配できる効果を有する。

【0043】そして、断熱材を予め装着した場合は、上記の効果に加え断熱材被覆の現場施工も省略でき、しかもこの断熱材は工場生産的に被覆されかつ断熱検査の実施もできるため、結露防止など断熱性も良く、かつ断熱材の取り付け状態も確実となる等の効果を有する。

【0044】さらに、受口に対する挿口の接続挿入深さが、管外径より1.5倍以上と大きくされ、具体的には従来の規格に対し2.4倍以上とされ、さらに受口奥方の拡径部のテーパ角と挿口端面の内角との組み合わせにより、枝管に冷媒搬送管を接続する場合の仮支持が確実に行なえ、この発明の冷媒管用分岐継手の分配管の接続作業が容易となり、また蟻付けの信頼性も増すなどの効果を有する。

#### 【図面の簡単な説明】

【図1】請求項1の発明にかかる冷媒管用分岐継手の平面図である。

【図2】図1に示した冷媒管用分岐継手の本体を構成する継手の説明平面図である。

【図3】図1に示した冷媒管用分岐継手の一例を示す説

明斜視図である。

【図4】請求項1の発明にかかる冷媒管用分岐継手の他の実施の形態を示す平面図である。

【図5】請求項2の発明にかかる冷媒管用分岐継手の平面図である。

【図6】請求項3の発明にかかる冷媒管用分岐継手の要部平面図である。

【図7】冷媒管用分岐継手の受口成形用型の側面図である。

【図8】冷媒管用分岐継手の使用状態説明図である。

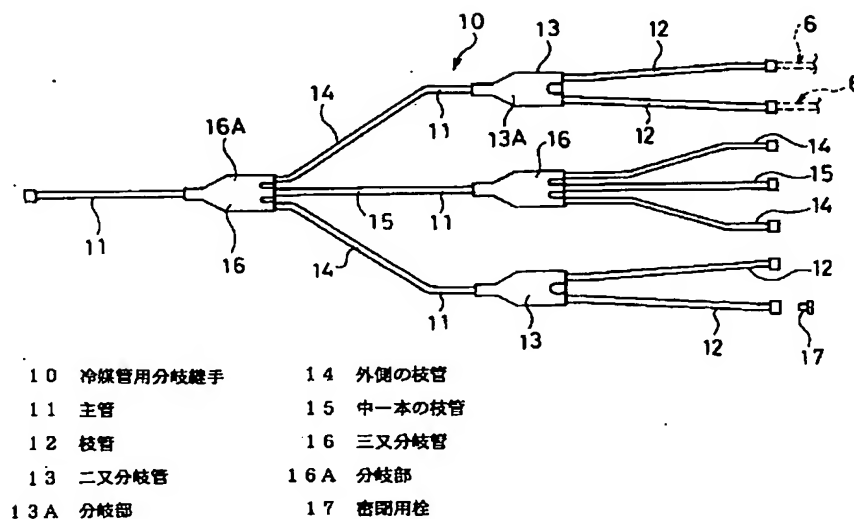
【図9】従来の冷媒管用分岐継手の平面図である。

【図10】他の従来の冷媒管用分岐継手の平面図である。

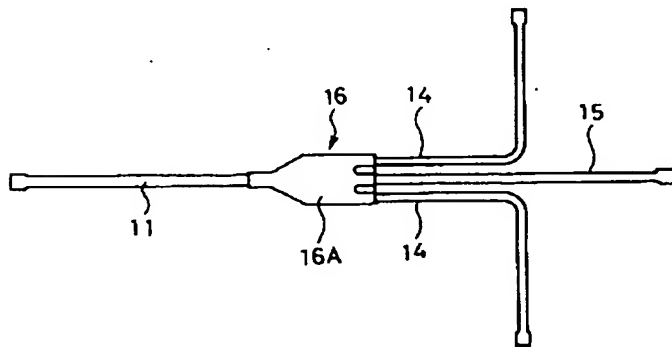
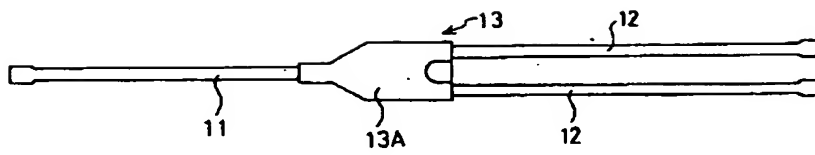
#### 【符号の説明】

- 6 冷媒搬送管
- 10 冷媒管用分岐継手
- 11 主管
- 11A 受口
- 11B 拡径部
- 12 枝管
- 12B 挿口部
- 12C 挿口端面
- 13 二又分岐管
- 13A 分岐部
- 14 外側の枝管
- 15 中一本の枝管
- 16 三又分岐管
- 16A 分岐部
- 17 密閉用栓
- 18 断熱材

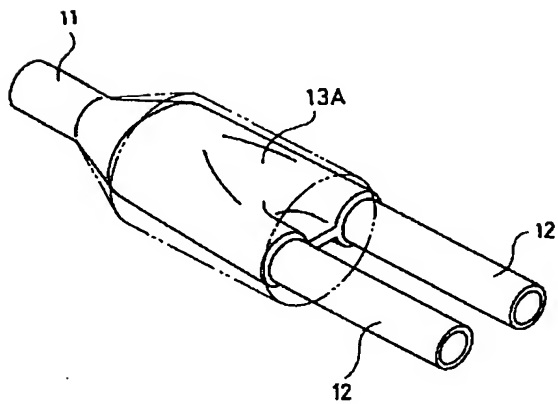
【図1】



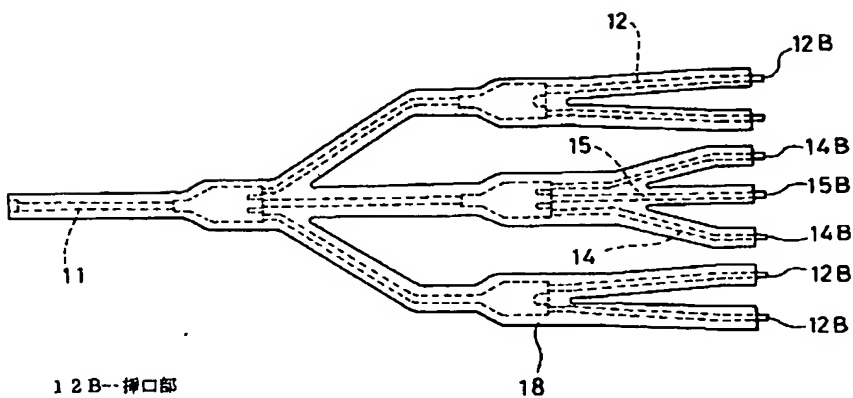
【図2】



【図3】



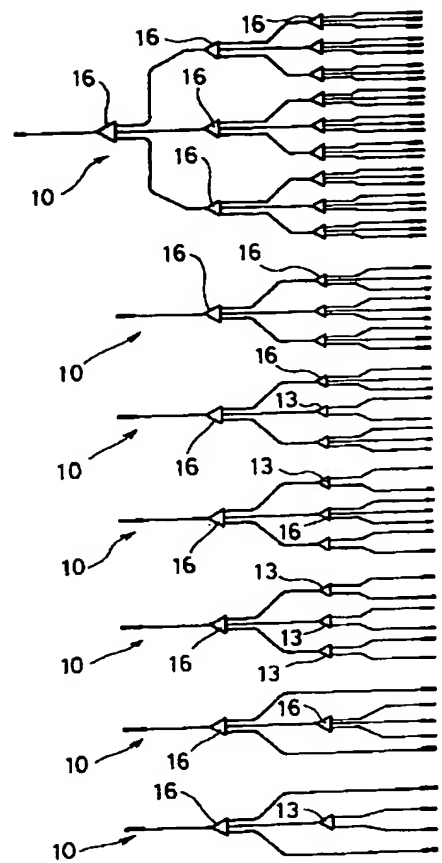
【図5】



12B--挿口部

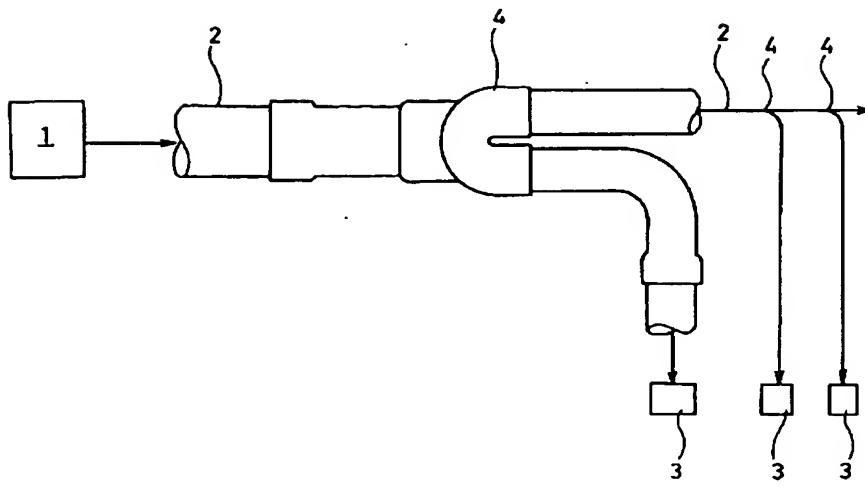
18--断熱材

【図4】



A schematic diagram of a cable-stayed bridge. A horizontal main beam is labeled 5. At its left end, there is a rectangular box labeled 1, with an arrow pointing to the beam labeled 2. Five vertical cables, each labeled 5A, are attached to the underside of the main beam 5. Each cable 5A extends downwards and is connected to a rectangular box labeled 3. The boxes 3 are arranged in a row below the beam.

【図9】





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